CLAIMS

1. Sol-gel process for the manufacture of nanocomposite materials photoluminescent at ambient temperature comprising the following steps:

   - preparing an aqueous or hydroalcoholic mixture containing a silicon alkoxide, an additional component A, and an acidic catalyst, wherein the molar ratio between water molecules and silicon atoms is equal to or higher than 4;
   - causing the mixture to gel obtaining a wet gel;
   - causing said wet gel to dry; and
   - densify the thus obtained dry gel by means of a thermal treatment having a maximum temperature comprised between 1200 °C and 1400 °C;

   characterized in that:

   - the additional component A is a dialkyldialkoxysilane, R_2-Si-(OR')$_2$, or an alkyltrialkoxysilane, R-Si-(OR')$_3$, wherein R and R' radicals are not aromatic; and
   - in the range from 300 to 800 °C the thermal treatment is carried out under an atmosphere made up of pure HCl or a mixture containing at least 5% by volume of HCl in an inert gas, said atmosphere being anhydrous and not containing oxygen.
2. Process according to claim 1 wherein the silicon alkoxide is chosen between tetramethoxysilane and tetraethoxysilane.
3. Process according to claim 1 wherein the acidic catalyst is HCl.
4. Process according to claim 1 wherein the –R groups of the additional component A are chosen among the radicals methyl, ethyl, propyl and butyl, and the –OR groups of the additional component A are chosen among the radicals methoxy, ethoxy, propoxy and buthoxy.
5. Process according to claim 4 wherein the additional component A is chosen between methyltrimethoxysilane and methyltriethoxysilane.
6. Process according to claim 1 wherein the molar ratio between the silicon alkoxide and the additional component A is comprised between 1.86 and 999.
7. Process according to claim 6 wherein said molar ratio is comprised between 2.33 and 9.
8. Process according to claim 1 wherein pyrogenic silica is added to the sol.
9. Process according to claim 1 wherein gelation is obtained by raising the pH of the sol.
10. Process according to claim 9 wherein raising the pH of the sol is realized by adding a

solution of ammonia.

11. Process according to claim 1 wherein sol gelation is obtained by raising the temperature at a value in the range between 40 and 60 °C.
12. Process according to claim 1 wherein drying of the wet gel is obtained by evaporation of the liquid in the gel pores.
13. Process according to claim 1 wherein drying of the wet gel is obtained by supercritical extraction of the liquid in the gel pores.
14. Process according to claim 13 wherein, before the supercritical extraction, the wet gel is subjected to an operation of exchange of the liquid in the gel pores.
15. Process according to claim 1 wherein the sol is deposited in form of a thin layer on a substrate by immersing this latter in the sol and then extracting the substrate from the sol.
16. Process according to claim 1 wherein the sol is deposited in form of a thin layer on a substrate by depositing a drop of the sol on the substrate and rotating this latter at high speed.
17. Nanocomposite materials photoluminescent at ambient temperature produced according to the process of claim 1.
18. Nanocomposite materials photoluminescent at ambient temperature produced according to the process of claim 8.
19. Supported thin layers of nanocomposite materials photoluminescent at ambient temperature produced according to the process of claim 15.
20. Supported thin layers of nanocomposite materials photoluminescent at ambient temperature produced according to the process of claim 16.